

## SELF-CONTAINED AIR LIFTED SEAT APPARATUS

### 1. Background of the Invention

#### 5 A. Field of Invention

The present invention relates to the field of medical devices and, more specifically, to an inflatable device used to assist an invalid or physically disadvantaged person in moving from a seated position to a standing position.

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#### B. Description of the Related Art

The impact of the aging population of the United States is well recognized and has profound socioeconomic implications, not the least of which is the conversion of nursing home care into a major industry. Also, not the least of the inevitable effects of aging is the loss of lean body (muscle) mass with the result of muscle weakness. There are several contributing factors involved in this loss. Loss of appetite, poor dentition, lack of exercise, dwindling blood supply (particularly to the lower extremities) and down regulation of metabolism are all conspirators in this process. While these factors can be offset by improved nutrition and regulated exercise, the results are related to a maintained status quo rather than a return to physical vigor. Further loss may be forestalled but regeneration of lost muscle is dependent on synthesis of muscle protein and restoration of cellular activity. Both of these requisites are the victims of the aging process of muscle. The bottom line of this aspect of the aging process is that muscle weakness is the expected companion of the senior population.

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Significant physical strength is not a prerequisite to a self-sufficient life style, but physical mobility is, and a level of muscle strength is a requirement for mobility. A consistent feature of early impairment of mobility is difficulty in getting up from a chair. Weakness of the extensors of the knee (the quadriceps femoris) results in difficulty rising from a chair, stair climbing and even walking. Limitations in those functions contribute to further activity

restrictions which in turn result in progressive muscle weakness. Progressive limitations of physical activity complete a cycle of physical deterioration and diminishing lifestyle.

The preservation of mobility is thus the key to the maintenance of a useful, independent  
5 and psychologically fulfilling lifestyle. To that end the use of a device that permits the capability of rising from a chair and allowing walking is offered as a practical solution to the problem of physical imprisonment by the inability to move independently.

Various types of devices have been proposed to address this problem such as U.S. Patent  
10 Nos. 3,479,087 to Burke, 5,375,910 to Murphy and 5,505,518 to Pike. These patents all disclose a pneumatic powered seat erector that consists of an upper and lower plate hinged together at one end. The devices also include an inflatable bladder positioned between the plates. As the bladder inflates, the plates begin to separate at the edge opposite the hinge causing the upper plate to pivot forward - thereby raising the individual from a seated position to a standing  
15 position. All three patents do not mimic the initial movement of the seated individual as he or she begins stand. At inflation, the upper plate pivots forward so that the individual is lifted only from the back and not from the front. This pivot only action causes the individual to slide off the seat.

20 U.S. Patent No. 4,629,162 to Porché discloses a portable pneumatic lift that includes an inflatable single chamber air bag, a pressurized air source and a remote control for operation of the air source. The air bag is wedged shape in that when inflated the height at the back of the air bag is about 13 inches and the height at the front of the air bag is about 10 inches. Although inflation of the air bag in Porché better mimics the initial movement of a seated individual as he  
25 or she begins to stand, the angle of pitch is not sufficient to fully assist the individual to stand from a seated position.

U.S. Patent No. 4,905,329 to Heilner discloses an inflatable seat cushion consisting of an inflatable ring whereby the front portion of the ring is restricted during inflation thereby allowing

the back portion of the ring to inflate at a height 3-7 times that of the front portion. Although Heilner allows for some elevation in the front portion, the inflatable ring must be sized appropriately to prevent an individual from falling through the center of the ring.

5        U.S. Patent Nos. 5,361,433 and 5,742,957, both to Vanzant, disclose an inflatable bag having multiple cavities that inflate sequentially. The devices of these patents, however, do not provide a means for a washable fabric cover or the ability to place the compressor within a pocket or compartment on either side of the bladder.

10       What is needed is a device that elevates and pitches forward the seated individual, which mimics the change to a standing position. This will facilitate the effective contraction of quadriceps muscles by reducing the extent of muscle shortening necessary to allow straightening of the legs at the knee. As the present invention discloses, a forward pitch level of approximately thirty degrees is sufficient to produce the desired effect. This degree of  
15      inclination can be achieved by an approximate seven inch elevation of the dorsal plane of the seated position over the ventral plane. This effect can be accentuated by a two inch elevation of the seat cushion itself. The positional change produced by this device thus mimics the initial movements of the unassisted rise from a seated position in a normal circumstance. Therefore, performance of the initial movement by the device allows the completion of the standing process  
20      by the user. In this way the disadvantages known in the art can be overcome in a way that is better, more efficient and that provides better overall results.

## II. Summary of the Invention

25       The present invention overcomes the aforementioned disadvantages by providing an inflatable device that produces a forward pitch level of approximately 30 degrees that is sufficient to produce the desired effect. In addition, the degree of inclination can be achieved by an approximate 7 inch elevation of the dorsal plane of the seated position over the ventral plane. This effect can be accentuated by a 2 inch elevation of the seat cushion itself. The positional

change produced by this device thus mimics the initial movements of the unassisted rise from a seated position in a normal circumstance. Therefore, performance of the initial movement by the device allows the completion of the standing process by the user.

5 It is therefore one object of the present invention to provide an inflatable lift device that mimics the initial movement of a seated person to a standing position.

It is another object of the present invention to provide an inflatable lift device where the front portion rises to assist the seated person to a standing position.

10 It is yet another object of the present invention to provide an inflatable lift device that is portable and lightweight.

15 It is yet another object of the present invention to provide an inflatable lift device with one embodiment that contains a single valve for inflation and rapid deflation.

It is yet another object of the present invention to provide an inflatable lift device that provides a removable washable cover.

20 **III. Brief Description of the Drawings**

The invention may take physical form in certain parts and arrangement of parts, a preferred embodiment of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof and wherein:

25 FIGURE 1 is a perspective view of the present invention showing the bladder with the cover removed.

FIGURE 2 is a perspective view of the bladder with the cover attached.

FIGURE 3 is a top view of the support plate.

FIGURE 4 is a side view of the base showing the location of the compressor  
5 compartment.

FIGURE 5 is a side view of the inflatable bladder.

FIGURE 6 is a perspective view of the inflated bladder showing one embodiment  
10 with separate intake and exhaust valves.

FIGURE 7 illustrates the exhaust valve in the closed position.

FIGURE 8 illustrates the exhaust valve in the opened position.

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**IV. Description of the Preferred Embodiment**

Referring now to the drawings wherein the showings are for purposes of illustrating a preferred embodiment of the invention only and not for purposes of limiting the same, FIGURES 20 1 and 2 show an air lift seat apparatus 10 that includes a base 12, a bladder 14, an intake/exhaust valve 16, a pocket or compartment 18, a self-contained air compressor 20 and a removable cover 22 (FIGURE 2). The base 12 is preferably made of a rigid polystyrene material to provide stability to the apparatus when placed on a chair. The base 12 has a front 24, a back 26 and two sides 28, 29 and is preferably about 18 inches wide, 18 inches deep and 1 inch in height.  
25 However, the base 12 can be any suitable size to fit a standard sized chair, seat cushion of a sofa or similar type of sitting apparatus as along as chosen with sound engineering judgment.

Referring now to FIGURES 2 and 3, in the preferred embodiment a connecting means 27 is provided to selectively attach the cover 22 to the base 12. The connecting means 27 may be of

any type chosen with sound engineering judgment such as snaps 30, hook and loop fasteners such as Velcro® (not shown) or a zipper (not shown). The cover 22 can be made of any material chosen with sound engineering judgment but preferably is formed of a washable fabric. In the preferred embodiment, a slip prevention material 38 is provided on at least a portion of the top  
5 23 of the cover 22. This slip prevention material 38 makes it difficult for a person to slip off of the lift seat apparatus 10 while the bladder 14 is inflating. The cover 22 is preferably sized slightly larger than the bladder 14 when the bladder 14 is fully inflated to facilitate easy application and removal of the cover 22.

10 With reference now to FIGURES 3 and 4, the compartment 18 that holds or houses the air compressor 20 can be located on either side of the bladder 14 to facilitate use by either hand of the seated person. The compartment 18 is preferably attached to either side 28, 29 of the base 12 and is located near the front 24 of the base as shown in FIGURE 3. The compartment 18 can either be an integral part of the base 12 or can be a separate piece that attaches to the base 12 by  
15 any means chosen with sound engineering judgment. The preferred height of the compartment 18 is approximately 2 inches. The length and the width of the compartment 18 are determined by the type of air compressor used to inflate the bladder 14. The preferred air compressor 20 is a portable, commercially available, rechargeable type compressor commonly known in the art and thus will not be described further. An air hose 32 is provided to transport air from the air  
20 compressor 20 to the bladder 14. As shown in FIGURE 1, the first end 34 of the hose 32 is connected to the air-compressor 20 and the second end 36 of the hose 32 is connected to the intake/exhaust valve 16 by means commonly known in the art.

Referring to FIGURES 1 and 5, the bladder 14 is preferably made from a single piece of  
25 material. The material can be any type of flexible material chosen with sound engineering judgment that allows the bladder 14 to expand upon inflation and contract upon deflation. The bladder 14 further contains a front portion 40, a rear portion 42, two trapezoidal shaped side panels 44, 45, a top 46 and a bottom 48. The length and width of the bottom 50 are similarly sized to fit the base 12 as described above. The bladder 14 is designed to mimic the initial

movements of a seated person when that person begins to stand. Therefore, when the bladder 14 begins to inflate the front portion 40 and the rear portion 42 will inflate simultaneously. When fully inflated, the rear portion 42 is at least three times higher than the front portion 40. In one embodiment the rear portion 42 is nine inches high and the front 40 portion is 2 inches high.

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With reference now to FIGURE 1, an intake/exhaust valve 16 is located on the side 44 of the bladder. The valve can be located on either side 44, 45 to facilitate use by either hand of the seated person as with the compartment 18 as described above. The valve 16 can be any type of mechanical valve commonly known in the art. In one embodiment the valve 16 is a ball type 10 valve 50 as shown in FIGURES 7 and 8. The ball valve 50 further consists of a handle 52, a core 54 and an aperture 56 and a housing 58. FIGURE 7 shows the ball valve 50 in the open position. When the ball valve 50 is in the open position the aperture 56 is parallel to the housing 58 and air can enter or escape from the bladder 14. FIGURE 8 shows the ball valve 50 in the closed position. When the ball valve 50 is in the closed position the aperture 56 is perpendicular to the 15 housing 58 and air cannot enter into or escape from the bladder 14. Another embodiment of the present invention is shown in FIGURE 6. In this embodiment the apparatus contains two valves. The first valve 60 is the intake valve and the second valve 62 is the exhaust valve. In this embodiment, the hose 32 connects the air compressor 20 to the intake valve 60. The exhaust valve 62, when opened, permits air to exit the bladder to the atmosphere. As a result, the bladder 20 can be deflated without removal of the air compressor hose 32.

Operation of the present invention will now be described. The air lift seat apparatus 10 can be used to assist a person in moving from a standing position to a seated position and from a seated position to a standing position. To move from a seated position to a standing position, the 25 person simply turns the handle 52 on the ball valve 50 and rotates it 90 degrees until the aperture 56 is parallel to the housing 58. The person then activates the air compressor 20 thus allowing air to enter the bladder 14. As the bladder 14 begins to inflate the front portion 40 and the rear portion 42 begin to rise simultaneously thereby slowly lifting the seated person. As the front portion 40 reaches its maximum height as described above, the rear portion 42 will continue to

inflate thereby creating a pitch angle. As the rear portion 42 continues to inflate, the seated person is further lifted until the rear portion 42 reaches its maximum height as described above thereby gently assisting the seated person to a standing position. Conversely, in assisting a person to move from a standing position to a seated position, the person simply inflates the

5 bladder 14 as previously described. Once the bladder 14 is fully inflated the person deactivates the air compressor 20. The person then rotates the ball valve 50 by 90 degrees until the aperture 56 is perpendicular to the housing 58. This will prevent air from escaping from the bladder 14 until the person is ready to be seated. The person then backs into the apparatus 10 and places his/her weight onto the cover 22 that is positioned over the bladder 14. Once the person is

10 leaning against the apparatus 10, the person then rotates the ball valve 50 by 90 degrees until the aperture 56 is parallel to the housing 58 thereby permitting the air to escape from the bladder 14 thus gently assisting the person to move from a standing position to a seated position.

The preferred embodiments have been described, hereinabove. It will be apparent to  
15 those skilled in the art that the above methods may incorporate changes and modifications without departing from the general scope of this invention. It is intended to include all such modifications and alterations in so far as they come within the scope of the appended claims or the equivalents thereof.

20 Having thus described the invention, it is now claimed: